

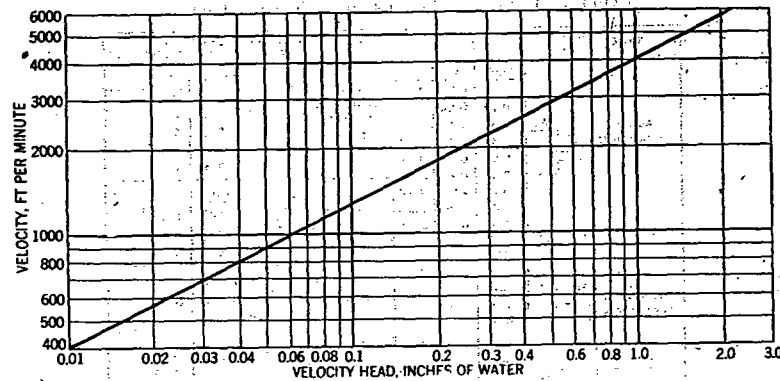


FIG. 6. RELATION BETWEEN VELOCITY AND VELOCITY HEAD FOR STANDARD AIR

noted, however, that absolutely reliable dynamic loss coefficients are not yet available for all duct elements and that the information available for pressure losses due to area changes is generally restricted to symmetrical area changes.

Fig. 6, which shows the relation of velocity pressure to velocity for standard air ($V = 4005\sqrt{H_v}$), can be conveniently used to find the total dynamic pressure loss for any duct element with known *dynamic loss coefficient* C .

PRESSURE LOSSES IN ELBOWS

Dynamic loss coefficients are nearly independent of the air velocity and are affected by the roughness of the duct walls only in the case of bends,

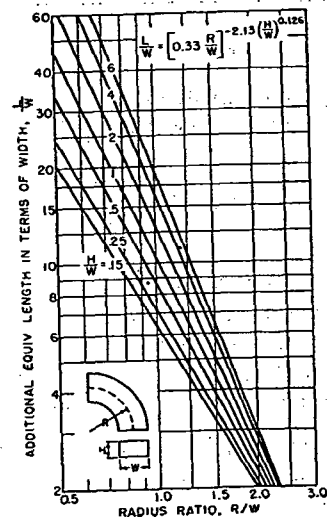


FIG. 7. LOSS IN 90-DEG ELBOWS OF RECTANGULAR CROSS SECTION

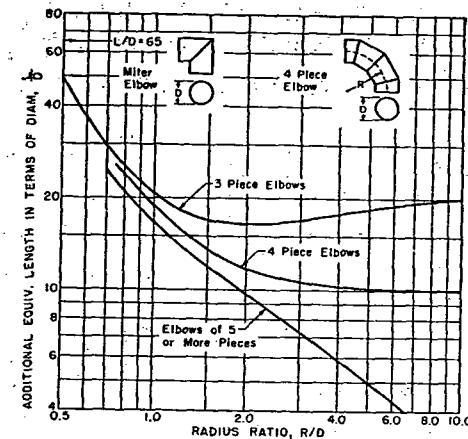


FIG. 8. LOSS IN 90-DEG ELBOWS OF ROUND CROSS SECTION

for which the dynamic losses are often grouped with the friction losses to facilitate design calculations. An A.S.H.A.E. survey⁶ of available data has indicated that the method of expressing the combined dynamic and friction losses due to an elbow as equivalent to the loss in a length L of similar straight duct is justified for design purposes, owing to the relation of the loss to the corresponding friction factor, f .

Fig. 7 gives the *additional equivalent length* of duct in terms of widths W for elbows in rectangular ducts; Fig. 8 gives the *equivalent length* of duct in terms of diameters D for round ducts. When these curves for *additional equivalent length* are used, the straight lengths of duct between elbows should be measured to the intersection of their center lines.

Example 4: (Use of Fig. 7 for the calculation of elbow losses.)

Given the portion of a duct system shown in Fig. 9, it is required to determine the pressure loss between points A and D. Air at standard conditions is being supplied at the rate of 2000 cfm in a 6- by 24-in. galvanized duct of average construction. Elbows No. 1 and 2 have centerline radii of 18 and 9 in., respectively.

Solution: For elbow No. 1 the radius ratio is $\frac{R_1}{W_1} = \frac{18}{24} = 0.75$ and the aspect ratio is $\frac{H_1}{W_1} = \frac{6}{24} = 0.25$. The additional equivalent length for elbow No. 1 in terms of W

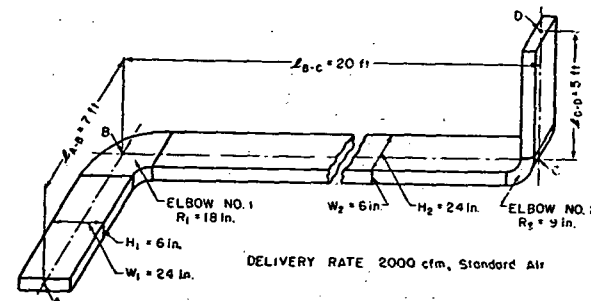


FIG. 9. PORTION OF DUCT SYSTEM FOR Example 4